
Software Searches for Better Spacecraft-Navigation Models

ADAPT is a computer program that searches for better mathematical models for spacecraft navigation. The task of tuning trajectory-determination models for interplanetary navigation is complex, requiring an intensive search of multiple dynamical and nondynamical models that yield trajectory solutions with minimal errors. By automating the search, ADAPT eases the task of human analysts and enables them to consider wider ranges of potential solutions. ADAPT uses genetic algorithms to search a range of relevant parameters in a user-selected design space to arrive at values for those parameters that best fit the measured spacecraft-tracking data. The user's guide for ADAPT reviews the theoretical basis of the program and presents two example applications. One example is that of selecting a solar-radiation model for the Mars Pathfinder (MPF) mission using MPF tracking data and an extended Kalman filter from prior spacecraft-navigation software. The second example is of the use of tracking data from the Stardust

spacecraft mission combined with a pseudo-epoch-state batch filter and an empirical small-forces model to find improved impulse models for use during Stardust attitude adjustments.

This program was written by Todd Ely of Caltech and William Crossley of Purdue University for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1).

This software is available for commercial licensing. Please contact Don Hart of the California Institute of Technology at (818) 393-3425. Refer to NPO-30552.

Software for Partly Automated Recognition of Targets

The Feature Analyst is a computer program for assisted (partially automated) recognition of targets in images. This program was developed to accelerate the processing of high-resolution satellite image data for incorporation into geographic information systems (GIS). This program creates an advanced user interface that embeds proprietary machine-learning algorithms in commercial image-processing and GIS software. A human analyst provides sam-

ples of target features from multiple sets of data, then the software develops a data-fusion model that automatically extracts the remaining features from selected sets of data. The program thus leverages the natural ability of humans to recognize objects in complex scenes, without requiring the user to explain the human visual recognition process by means of lengthy software. Two major subprograms are the reactive agent and the thinking agent. The reactive agent strives to quickly learn the user's tendencies while the user is selecting targets and to increase the user's productivity by immediately suggesting the next set of pixels that the user may wish to select. The thinking agent utilizes all available resources, taking as much time as needed, to produce the most accurate autonomous feature-extraction model possible.

This program was written by David Opitz, Stuart Blundell, William Bain, Matthew Morris, Ian Carlson, and Mark Mangrich of Visual Learning Systems, Inc., for Stennis Space Center. For further information, contact the Stennis Commercial Technology Office at (228) 688-1929. SSC-00166